The Thai Anesthesia Incidents Study (THAI Study) of Ambulatory Anesthesia: Part I: Method, Geographic Distribution and Population

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Background: *There is a continuing trend to have more elective surgical operations performed on an outpatient basis.*
Objective: *To determine the proportional distribution of anesthetic procedures performed in ambulatory elective surgery at different levels of hospitals across Thailand.*
Material and Method: *A prospective and descriptive study was conducted at 20 hospitals comprising seven universities, five regional, four general and four district hospitals across Thailand. Consecutive outpatients who were undergoing elective surgical operation were included and their relevant data were selected and extracted for summary by using descriptive statistics.*
Results: *From the database of 118,027 anesthetics performed for elective surgical operation, 7,786 (6.6%) were outpatients. According to this, 7,016 (90.1%) were practiced in university hospitals, 656 (8.4%) in regional or tertiary hospitals, 71 (.9%) in general or provincial hospitals, and 43 (0.6%) in district hospitals. The frequency of the ambulatory anesthesia was higher in hospitals in the central region, especially in university hospitals in Bangkok than in other regions. The majority of cases (86%) received their initial pre-anesthetic evaluation in the operating room while 12% were evaluated at the outpatient office. About 28% of the cases presented with pre-anesthetic abnormal conditions. The relatively common pre-anesthetic diseases were hypertension, diabetes mellitus, anemia, arrhythmia, and asthma.*
Conclusion: *From the results of the present study, the authors have concluded that the rate of expansion of ambulatory anesthesia in Thailand is relatively slow, and varies according to the type of hospital and its geographic region. This indicates further studies should be formally conducted to determine factors affecting the practice of ambulatory surgery in Thailand. A large proportion of patients receive initial pre-anesthetic evaluation in the operating room on the day of surgery. This indicates that a system of pre-anesthetic evaluation should be set up for outpatients such as a pre-anesthetic care clinic should be set up for outpatients.*

Keywords: *Ambulatory, Anesthesia, Outpatient*

J Med Assoc Thai 2007; 90 (8): 1558-64
Full text. e-Journal: *http://www.medassocthai.org/journal*

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Because of economic constraint and increasing caseload, there has been a shift from inpatient to outpatient surgery (ambulatory surgery) in many countries[1]. In Thailand, there is a continuing trend to have more elective surgery performed on an outpatient basis in both government-run hospitals and private sectors[2,3]. This has led to an expansion from inpatient anesthesia services to outpatient anesthesia services. One of the challenges in ambulatory anesthesia is to maintain the highest favorable outcomes with the lowest complication rate. Therefore, the authors conducted this multicentered study to find out practices and outcomes related to anesthesia for elective outpatient surgical procedures across Thailand. The present report (part I) focuses on the distribution of practice of ambulatory anesthesia at different levels of government-run hospitals across Thailand, the sites and/or types of operative procedures, pre-anesthetic evaluation and condition of the patients. The anesthesia management and incidents of adverse events have been presented in the subsequent part (part II) of the present study.

Material and Method

The present study was a multicentered research of twenty hospitals comprising seven universities (Chiang Mai University, Chulalongkorn University, Khon Kaen University, Mahidol University: Siriraj Hospital and Ramathibodi Hospital, Pramongkutklao Medical College and Prince of Songkhla University), five tertiary hospitals (Buddhachinaraj Hospital, Ratchaburi Hospital, Nakorn Srithammarat Hospital, Khon Kaen Hospital and Neurology Institution), four general hospitals (Lampoon Hospital, Pichit Hospital, Baanpong Hospital and Trang Hospital) and four district hospitals (Sanpatong Hospital, Nakorn-Thai Hospital, Kranuan Hospital and Nampong Hospital) across Thailand. The study protocol was approved by the ethics committee of each hospital.

For each patient receiving anesthesia in an elective surgical procedure, anesthetists or nurse-anesthetists completed a preplanned structured data entry form (form 1) which included a series of patient-related, surgical related and anesthesia-related variables.

Ambulatory anesthesia was defined as an anesthesia service for an outpatient who is receiving the same day surgery[4].

The data entry form (form 1) was developed according to the Thai Anesthesia Incidents Study (THAI study) of anesthesia outcomes [5] which was initiated by the Royal College of Anesthesiologists of Thailand in 2003. Several meetings including workshops and/or internal audits were held for site managers and research assistants including anesthesia-providing personnel in order to standardize the study protocol. The pilot study had been performed for two months before the main study began.

The present study was an observational research design. The anesthetic management, including the pre-anesthetic evaluation and choice of anesthesia, was left on the discretion of the attending anesthesia personnel of each hospital. Before giving anesthesia, the anesthesia-attending personnel were asked to check the preoperative medical conditions and other preoperative factors which might have affected the course of the anesthetic management such as smoking, alcohol, drugs abuse, and allergy. The patient condition was classified according to the American Society of Anesthesiologists physical status scores. Moreover, demographic characteristics of the patients including age and sex and the result of pre-anesthetic airway assessment for difficult airway management were also recorded. With regard to the surgical procedures, the specified operations were recoded by converting them into groups according to the site of operation. The anesthesia-related factors such as main anesthetic techniques, additional anesthetic techniques, airway equipments, monitors, and anesthetic drugs were recorded in the data entry form and verified by the site manager. The anesthesia course of every outpatient was followed up until home readiness. Adverse events including unplanned admissions were also recorded.

To ensure the reliability of the data among participating hospitals, the anesthesia-providers at each site were trained and supervised by well-trained site managers. As well, an internal audit was done by the project's quality assurance team. External auditing was performed by external evaluators from the Clinical Research Collaboration Network (CRCN).

Data management

All data entry forms were reviewed and verified by site managers for accuracy and completeness before submitting to the center where the process of verification would be done. The site managers or the responsible anesthesia personnel were contacted for verification, correction, or completion of the incorrect, doubtful, or missing information. All data were cleansed at the data management centers before entering onto the computer. To ensure the reliability of the data entry, the standard double-data entry technique was used. The term 'opd' was used for outpatients. Its

consistency and logical verification with the sites and types of the surgical procedures were reviewed by at least two reviewers. Every disagreement was discussed and judged in order to achieve a consensus. Only the data of outpatients who received anesthesia services in elective surgical procedures were selected and extracted for analysis.

Data analysis

Data analysis was done by using SPSS version 9. Descriptive statistics was used for demographic, surgical, and anesthetic data. Furthermore, proportions with 95% confidence intervals (95%CIs) of practice in ambulatory anesthesia stratified by the level of the hospital and its geographic distribution were compared.

Results

From the data base of 118,027 anesthetics performed in elective surgery, 7786 (6.6%) were classified as outpatients or ambulatory anesthesia in 20 hospitals, *i.e.* seven university hospitals, five regional hospitals, four general hospitals and four district hospitals across Thailand (Table 1). According to this, 7,016 (90.1%) were performed in university hospitals, 656 (8.4%) in regional or tertiary hospitals 71 (0.9%) in general or provincial hospitals and 43 (0.6%) in district hospitals, respectively. The frequency of the ambulatory anesthesia was higher in hospitals in the central region, especially university hospitals in Bangkok than in other regions. Table 2 shows the distribution of operative sites and/or procedures stratified by the types of hospitals. Table 3 presents the distribution of cases according to the age groups, gender, and ASA physical status classes. The majority of the cases were in the age group between 15 to 60 years (54.7%) while 22% was distributed in the extreme age groups, *i.e.* the infant (6.7%) and the elderly (15.3%) and 23.3% in children between one to fifteen years. The number of females (55.8%) was higher than males (44.1%). The majority of the cases (86%) received initial pre-anesthetic evaluation

Table 1. Frequency distribution of practice of ambulatory anesthesia in hospitals stratified by geographic regions

	Type of hospital (No. of beds)	No. of elective surgery	No. of ambulatory anesthesia	Percent of ambulatory anesthesia (95%CI)
Central Thailand				
Chulalongkorn	University (1500)	12,292	358	2.9 (2.6, 3.2)
Phramongkutklao	University (800)	5,903	1,028	17.4 (16.5,18.4)
Ramathibodi	University (1000)	12,590	1,644	13.1 (12.5,13.7)
Siriraj	University (2400)	22,964	2,877	12.5 (12.1,13.0)
Ratchaburi	Regional (899)	3,931	99	2.5 (2.1, 3.1)
Banpong	General (420)	1,770	7	0.4 (0.2, 0.8)
Neurological Institute	Tertiary (300)	1,105	9	0.8 (0.4, 1.5)
The North				
Buddhachinaraj	Regional (948)	6,629	262	4.0 (3.5, 4.4)
Chiang Mai	University (2000)	9,107	211	2.3 (2.0, 2.6)
Lamphun	General (402)	1,944	9	0.5 (0.2, 0.9)
Nakhonthai	District (60)	58	1	1.7 (0.3, 9.1)
Phichit	General (405)	2,600	10	0.4 (0.2, 0.7)
Sanpatong	District (120)	334	42	12.6 (9.4,16.6)
The North-eastern				
Khon Kaen	Regional (900)	7,529	10	0.1 (0.1, 0.2)
Kranuan	District (90)	273	1	0.4 (0.1, 2.0)
Nampong	District (60)	209	0	0.0 (0.0, 0.0)
Srinagarind	University (770)	7,791	147	1.9 (1.6, 2.2)
The South				
Nakon Si Thammarat	Regional (863)	8,969	285	3.2 (2.9, 3.6)
Songklanagarind	University (799)	7,987	751	9.4 (8.8, 1.0)
Trang	General (500)	3,979	10	0.3 (0.1, 0.5)

Table 2. Sites of operation and/or procedures stratified by types of hospita

Sites of operation and/or procedures	Type of hospital				
	University	Regional	General	District	Total
Extremities	1166	75	17	4	1262
Perineal-anal	1036	117	5	7	1165
Eye	428	14		1	443
Lower abdomen including kidney/ureter	429	9	7	1	446
Breast	244	148	6	18	416
Maxillo facial	221	7	5	0	233
Intraoral	97	11	1	0	109
Ear	50	1	4	0	55
Back	59	0	0	0	59
Neck Resection	28	2	0	0	30
Upper abdomen	26	5	0	0	31
Vascular	13	0	0	0	13
Thyroid	8	4	1	0	13
Airway					
*Micccro D/L	214	0	0	0	214
*Bronchoscope	49	14	0	0	63
*Sugery of larynx/trachea	8	1	0	0	9
Remote service					
*X-ray	150	0	0	1	151
*MR!	160	0	0	0	160
*Cardiac cath.	84	0	0	0	84
*Cardioversion	3	0	0	0	3
*Other	22	1	0	0	23
ECT	27	0	0	0	27
Other superficial	114	26	3	2	145
Other endoscopy	247	6	2	0	255
Other procedures	576	213	14	4	807

Data expressed as number

in the operating room while 12% were evaluated at the outpatient office or in the ward. Most of the cases were healthy (63.2% in ASA class 1 and 33% in ASA class 2), whereas, 3.8% were classified in ASA class 3. The results of the pre-anesthetic evaluation are summarized in Table 4. About 28% of the cases presented with pre-anesthetic abnormal conditions. The relatively common pre-anesthetic abnormal conditions were hypertension, diabetes mellitus, anemia, arrhythmia and asthma. Upper respiratory tract infection (URI) was presented in 35 cases. About 70% of URI occurred in children between 0-8 years old while 71% of the cases with a history of asthma were adult group. Nearly all of the hypertensive patients (98%) were adults and slightly more than half of them (56%) were above 60 year old. Diabetes mellitus was presented in 345 patients (4.4%), and all of them were adults. Two hundred and twenty-three patients (2.9%) presented with anemia, most of them

Table 3. Distribution of cases according to age group, sex and ASA physical status

Characteristics	n = 7786 (100%)
Age (years)	
0-1	521 (6.7%)
>1-15	1819 (23.4%)
>15-60	4256 (54.7%)
>60	1190 (15.3%)
Sex	
Male	3437 (44.1%)
Female	4345 (55.8%)
Missing	4 (0.1%)
ASA	
1	4923 (63.2%)
2	2569 (33.0%)
3	294 (3.7%)

Data expressed as number (%)

Table 4. Preoperative evaluation, preanesthetic history and/or conditions and current medications

	Number of cases	Percent of outpatients (n = 7786)
Preoperative evaluation		
- at ward or OPD	934	12.00
- in the operating room	6765	86.90
- missing	87	1.11
Preoperative condition		
- normal	5615	72.10
- abnormal or risky	2164	27.80
- missing	7	0.09
Respiratory system		
- Upper airway obstruction	3	0.04
- Upper respiratory tract infection	35	0.44
- Lower respiratory tract infection	5	0.06
- Restrictive lung disease	13	0.17
- Asthma	117	1.49
- COPD	21	0.27
- Difficult airway	7	0.09
- History of respiratory failure	3	0.04
Cardiovascular system		
- Hypertension	754	9.68
- History of congestive heart failure	9	0.12
- Congenital heart disease	29	0.37
- History of shock	2	0.03
- Vascular disease	13	0.20
- Ischemic MI	39	0.50
- Arrhythmias	95	1.20
- Valvular heart diseases	33	0.40
Neuro-muscular system		
- Alteration of consciousness	16	0.21
- Previous or concuurent CVA/TIA	31	0.40
- Spinal cord injury disease	7	0.09
- Peripheral neuropathy/myopathy	12	0.20
- Increased ICP	7	0.09
- Convulsion	23	0.30
- Myasthenia gravis	1	0.01
Hematology/Infection		
- Anemia	223	2.90
- Coagulopathy	6	0.08
- Hepatitis viral antigen (HBV, HAV)	20	0.30
- Platelets < 100,000	3	0.04
- HIV positive	15	0.20
Endocrine /metabolic disorder		
- Diabetes mellitus	345	4.43
- Electrolyte/acid-base imbalance	21	0.30
- Hyperthyroid	32	0.41
- Hypothyroid	10	0.13
- Others	14	0.18
Current medications		
- Antihypertensive	387	5.00
- Hypoglycemic drugs	162	2.10
- Bronchodilators	15	0.20
- Steroid (within 1 year)	14	0.20
- Anticoagulants(within 7 days)	11	0.14
- NSAID including aspirin	4	0.05
Miscellaneous		
- Previous sepsis	3	0.04
- Renal impairment	187	2.40
- Autoimmune diseases	4	0.05
- Liver diseases (cirrhosis, abnormal liver function, jaundice)	103	1.30
- Acsites	1	0.01
- Morbid obesity	61	0.80
- Pregnancy	4	0.05
Allergy		
- Drugs	36	0.46
- Dust	16	0.21
- Food	5	0.06
- Fur	1	0.01
Other risk behavior		
- Heavy smoking	230	3.00
- Alcohol	131	1.70
- Drug abuse	1	0.00

Data expressed as number and %

(88%) were adults and 67.3% of them were female. Only 15 patients (0.2%) had HIV positive blood and eight of them were adults, while seven of them were children. History of hepatitis viral infection was found in 20 patients (0.3%). As for their current medication, 387 (5%) were on antihypertensive, 162 (2.1%) hypoglycemic, and 15 (0.2%) bronchodilator. Only 14 (0.2%) presented with a history of current steroid use. Eleven patients (0.14%) received anticoagulants while four patients (0.05%) took non-steroid anti-inflammatory drugs. Thirty-six patients (0.46%) had a history of drug allergy.

Discussion

It is difficult to estimate how much ambulatory anesthesia is being performed in Thailand, as this varies from hospital to hospital. From a questionnaire survey in 1966[2], the practice on outpatients in Thailand varied greatly from 5% to 35% depending on the types of hospitals, i.e., regional hospitals (5%), university hospitals (21%), private hospitals (27%) and a children hospital (35%). The previous survey included joined two kinds of outpatients, same-day discharge, and overnight stay. In the present study, however, the authors included only those of with same-day discharge and found the percentage of the practice of ambulatory anesthesia for elective surgery varied from hospital to hospital according to their geographical region. Many

factors such as local needs, hospital policies, environmental factors including transportation, life style, culture, and the level of ancillary service may have affected this variation. Hence, further studies should be done to determine which factors affecting the practice of ambulatory anesthesia in Thailand.

From the present study, the authors found that the majority of patients, up to 86%, received initial pre-anesthetic evaluation at the operating room on the day of surgery. Despite most of the patients being healthy, the authors found that 28% of them presented with an abnormality and some of them had received medications that might have not only increased their risk but also affected the course of anesthesia unless they had been well prepared before surgery. Therefore, a system of pre-operative evaluation should be set up. Frost [8] pointed out the value of a pre-anesthesia care clinic for the improvement of pre-operative care and shortening hospital stay. In this setting, the anesthesiologists joined surgical and nursing colleagues initiating the process of patient evaluation and preparation for surgery in outpatient clinics. Advantages and disadvantages of pre-anesthesia care clinic have been discussed[9]. The advantages would include allowing patients to be appropriately assessed by anesthesiologists, providing a patient-family education, reassurance, and rapport, improving patient-anesthesiologist relationship, and providing proper anesthesia plan. It was shown that the lack of appropriate pre-operative assessment and preparation might have caused cancellation of surgical cases. A few disadvantages should be considered such as patient inconvenience, expense, and time for the healthcare team, and communications problems within the anesthesia care team. Therefore, setting a pre-anesthesia care clinic is becoming a big challenge in Thailand.

From the results of the present study, the authors have concluded that the rate of expansion of ambulatory anesthesia in Thailand is relatively slow and varies according to the types of hospitals and their geographic regions. This indicates further studies should be formally conducted to determine factors affecting practice of ambulatory in Thailand. A large proportion of patients receiving inadequate pre-anesthetic evaluation indicate that a system of pre-anesthetic evaluation, such as a pre-anesthesia care clinic, should be set up for outpatients.

Acknowledgements

The present research was accomplished by personal sacrifices and perpetual inspiration of attending anesthesiologists together with all associated medical personnel under the guidance of the heads of the departments of all sites in this multicentered study. The Royal College of Anesthesiologists of Thailand and the THAI Study group wish to thank the project advisors Professor Chitr Sitthi-Amorn and Associate Professor Joranit Kaewkungwal for their exceptionally wise, encouraging criticism and advice. We also wish to thank Professor Pyatat Tatsanavivat head of Clinical Research Collaborative Network (CRCN) for his continued support, encouragement and helpful suggestions.

The present study was financially supported by the Health Systems Research Institute (HSRI), the Faculties of Medicine of Chiang Mai University, Chulalongkorn University, Khon Kaen University, Mahidol University (Ramathibodi Hospital and Siriraj Hospital), Prince of Songkla University and the Thailand Research Fund.

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การเฝ้าระวังภาวะแทรกซ้อนทางวิสัญญีในผู้ป่วยผ่าตัดแบบผู้ป่วยนอกในประเทศไทย: I วิธีการศึกษา และข้อมูลประชากร

สุรีรัตน์ ศรีสวัสดิ์, ยอดยิ่ง ปัญจสวัสดิ์วงศ์, เทวารักษ์ วีระวัฒกานนท์, วิโรจน์ เพ่งผล, ประชุมพร คงฤทธิ์

***ภูมิหลัง**: ปัจจุบันมีแนวโน้มที่มีการทำผ่าตัดในผู้ป่วยนอกที่ต้องกลับบ้านในวันเดียวกันมากขึ้น*

***วัตถุประสงค์**: เพื่อศึกษาการหาการกระจายของสัดส่วนการให้บริการทางวิสัญญีสำหรับผู้ป่วยนอกในโรงพยาบาลระดับต่าง ๆ ทั่วภูมิภาคของประเทศไทย*

***วัสดุและวิธีการ**: เป็นการศึกษาแบบพรรณนาแบบไปข้างหน้า ในผู้ป่วยทุกรายที่เข้ามาตามลำดับสำหรับทำการผ่าตัดแบบ elective และคัดกรองเฉพาะผู้ป่วยที่ได้รับการบริการทางวิสัญญีแบบผู้ป่วยนอกและให้กลับบ้านในวันเดียวกันในโรงพยาบาล 20 แห่ง ซึ่งเป็นโรงพยาบาลมหาวิทยาลัย 7 แห่ง โรงพยาบาลศูนย์ 5 แห่ง โรงพยาบาลทั่วไป 4 แห่ง และโรงพยาบาลอำเภอ 4 แห่ง จากทุกภูมิภาคของประเทศไทย เพื่อนำข้อมูลมาสรุปโดยใช้สถิติเชิงพรรณนา*

***ผลการศึกษา**: จากฐานข้อมูลของผู้ป่วยทั้งหมด 118,027 รายที่ได้รับการวางยาสลบสำหรับการผ่าตัดแบบ elective มีผู้ป่วยจำนวน 7,786 ราย คิดเป็นร้อยละ 6.6 ได้รับการวางยาสลบแบบผู้ป่วยนอก โดยกระจายไปตามโรงพยาบาลมหาวิทยาลัย 7016 ราย (90.1%) โรงพยาบาลศูนย์ 656 ราย (8.4%) โรงพยาบาลทั่วไป 71 ราย (0.9%) และโรงพยาบาลอำเภอ 43 ราย (0.6%) โดยที่สัดส่วนของการให้บริการวิสัญญีในภาคกลางโดยเฉพาะอย่างยิ่งโรงพยาบาลมหาวิทยาลัยในกรุงเทพสูงกว่าภาคอื่น ๆ ผู้ป่วยส่วนใหญ่ได้รับการประเมินจากบุคลากรทางวิสัญญีที่ห้องผ่าตัดในวันผ่าตัดขณะที่อีก 12 คนได้รับการตรวจที่แผนกผู้ป่วยนอกก่อนผ่าตัด มีผู้ป่วยประมาณ 28% มีโรคประจำตัวที่พบได้บ่อยได้แก่ ความดันโลหิตสูง เบาหวาน ซีด หัวใจเต้นผิดจังหวะ และ โรคหอบหืด*

***สรุป**: พบอัตราการขยายการให้บริการทางวิสัญญีวิทยาสำหรับการผ่าตัดแบบผู้ป่วยนอกในประเทศไทยยังค่อนข้างต่ำ และแตกต่างกันไปตามชนิดของโรงพยาบาลและตามภูมิภาคต่าง ๆ ดังนั้นจึงควรมีการศึกษาวิจัยอย่างจริงจังถึงปัจจัยต่าง ๆ ที่มีผลต่อขยายการบริการทางวิสัญญีวิทยา การพบว่าผู้ป่วยส่วนมากถึง 86%ไม่ได้รับการตรวจจากบุคลากรทางวิสัญญีก่อนเข้าห้องผ่าตัด เป็นเครื่องบ่งชี้ว่าควรต้องมีการจัดตั้งระบบเพื่อให้ผู้ป่วยทุกคนได้รับการตรวจประเมินทางวิสัญญีก่อนวันผ่าตัด*